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VEGETATIVE PROPAGATION OF RHUS SEMIALATA MURR THROUGH CUTTINGS

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ABSTRACT

Rhus semialata Murr is a tree belonging to Anacardiaceae family. The fruits of R. Semialata Murr are edible and also have various medicinal properties. As it is an important NTFP bearing tree having multiple uses, it was thought worthwhile to study whether this tree species can be propagated through vegetative means i.e. by cuttings in addition to its propagation by seeds. About 70% of cuttings produced good and vigorous shoots. Also, the relationship between position of cuttings on the branch and the sprouting of shoots was observed. But all the cuttings failed to develop roots leading to the drying of all the shoots and ultimately causing drying and the death of all the cuttings.

KEYWORDS: Rhus Semialata Murr, Rhus Chinensis, Vegetative Propagation, Cuttings, Sprouting, Rooting & Cutting Positions

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Original Article

INTRODUCTION

Rhus semialata Murr (syn. *R. chinensis* Mill. *R. javanica* Linn.) also popularly known as Chinese Sumac is a shrub or a small tree of height up to 6m with spreading crown belonging to Anacardiaceae family. In India, it grows at an altitude of 3,000–7,000 ft in the outer Himalayan ranges including the hills of Assam, Khasi hills, Naga hills and Sikkim (Gurung, 2002; Rai and Sharma, 1994; Bhattacharjee, 1998). Also, it grows in upper Burma, China and Japan (Kiritikar and Basu, 1987). It is a deciduous tree and fruits from December to April (Singh *et al.*, 2014). Fruits are round, flat with diameter of about 0.5 mm and thickness of 2-3mm, fleshy, hairy and orange to red in colour. Seeds are hard and brownish black. Bidyalakshmi *et al.*, (2019) reported the presence of nutrients like protein, fat, carbohydrate, dietary fibre and vitamins like vitamin C, folates, carotenoids, α-tocopherol and minerals like Fe, Ca, Zn, K, Na and P in the fruits. Also they contain tannin, gallic acid and the potassium acid salts, together with small amount of aluminium, calcium, magnesium and iron, acid salts of maleic, tartaric and citric acids (Anonymous, (2003). The fruits are used for treatment of dysentery, diarrhoea and food poisoning. According to Zhasa et al., (2015), to treat Gastritis, the fruit pulp can be mixed with 1 tsp of stingless honey and taken with warm water once a day at night time for three days. In the case of urinary complaint due to the stone, powdered fruits mixed with egg can be given to person suffering from in kidney trouble (Lokendrajit *et al.*, 2011).

When the tree of Rhus semialata is infested with Chinese sumac aphids (*Melaphis chinensis* Bell), galls are formed which are highly valued commercial products. They are called Chinese gall, *Galla Chinensis* and are rich in gallotannins (Tian, 2009). They are used in traditional Chinese medicine to treat coughs, diarrhoea, night sweats, dysentery and to stop intestinal and uterine bleeding (Stroyan, 1997). *R. semialata* Murr compounds possess strong antiviral, antibacterial, anticancer, hepatoprotective, antidiarrheal and antioxidant activities (Djakpo and Yao, 2010). The gall of *R. semialata* Murr i.e. *Galla chinensis* has long been considered to possess many medicinal properties

(Zhang *et al*., 2009).

Although *R.semialata* Murr posses multiple useful properties, there is a lack of literature on the vegetative propagation of *R.semialata* Murr by cuttings. Present experiment was carried out to determine whether it can be propagated by vegetative means i.e. with branch cuttings which can be used in addition to the propagation by seeds. Also which part of a branch is best for obtaining cuttings was studied by analysing the relationship between the positions of cuttings on the branch and sprouting of shoots. Here, the positions of cuttings on a branch mean either the cuttings were obtained from the portion of the branch from centre to the tip of the branch or from the branch-stem junction to the centre of the branch.

METHOD AND METHODOLOGY

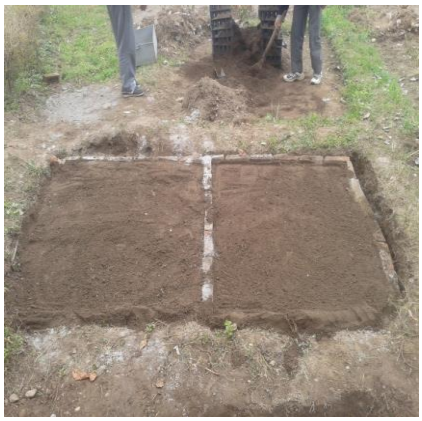
The present study on the propagation of *Rhus semialata* Murr was conducted in the nursery of the NWFPs division, Forest Research Institute Dehradun situated at 30^0 20' 40'' latitude and 77^0 52'12'' longitudes and located at 640.8 m above mean sea level. The climate ranges from sub tropical to tropical with an average mean annual precipitation of 2000mm. The average maximum temperature was 26.63°C where as average minimum temperature was 7°C for the period when the cuttings were planted.

A nursery bed of size of 1.5m X 1m was prepared (figure 1). To give correct texture to the soil, sand was mixed with the soil. Soil mixing having nursery soil and sand in equal proportions prove better than either pure nursery soil or sandy soils for raising *Populus ciliata* plants in nursery (Luna,1989). Therefore, this ratio of 50:50 for soil and sand was adopted for this experiment also.

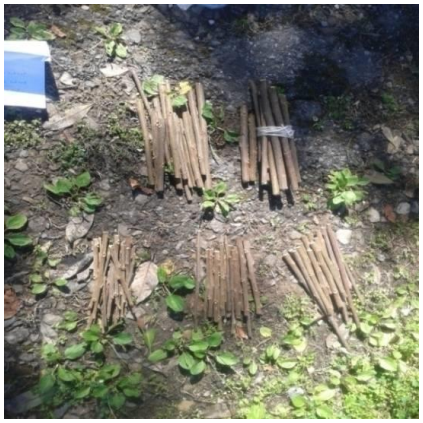
A total of 50 cuttings were obtained from a healthy mother tree and planted in the month of February. In February, the cuttings are full of reserve food materials. The mobilization of carbohydrates and rising temperature in February stimulates sprouting and rooting. Thus, vegetative propagation can be done more easily in February as compared to the other months of the year during which the cuttings were planted (Bhatt and Todaria, 1990).

Cuttings were divided into two groups viz. group A and group B. Group A consisted of cuttings which were obtained from the centre to the tip portion of the branch and group B from centre to the branch-stem junction. Each group consisted of 25 cuttings.

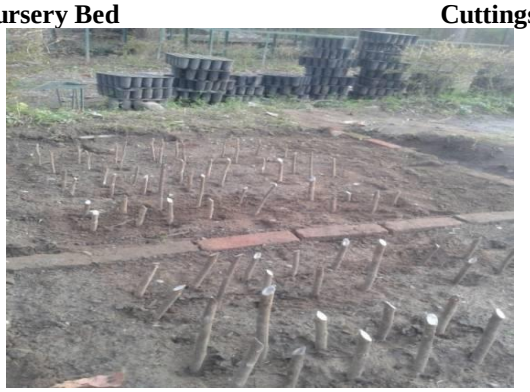
The cuttings were treated with rooting hormone before planting in the nursery bed. The nursery bed was moistened in advance to ease the planting of cuttings.The cuttings were planted by inserting them into the nursery bed in slanting position (figure 1). About $2/3^{rd}$ of the length of the cutting was buried in the soil and it was taken care that about 3-4 buds are present in the buried part. Wax was applied on the slanting top of the cuttings to prevent water loss and fungal attack. Then nursery bed was covered with leaf litter for mulching and moisture conservation. The nursery bed was monitored to maintaine the presence of adequate moisture in the soil to prevent the dessiccation of cuttings. Also weedings were done regularly.



Nursery Bed



Cuttings.



Cuttings Planted on Nursery Bed.

Figure 1: Nursery Bed and Cuttings.

Everyday nursery bed was examined and the sprouting of shoots were observed and noted down. χ^2 -test was applied using SPSS software to find out the relationship between the sprouting of cuttings and the position of the cuttings on the branch.

RESULTS AND DISCUSSIONS

Sprouting

The sprouting of shoots started on 17th day and continued up to 35th day from the day of planting of cuttings. After 35th day, no new shoot sprouted. A total of 35 out of 50 cuttings sprouted vigorously and developed healthy shoots (figure 2). The list of cuttings with whether they sprouted or not are given in table 1.

Table 1: Status of Shoot Formation in Cuttings

Group A		Group B	
Cutting No.	**Sprouting Yes(Y) or No (N)**	**Cutting No.**	**Sprouting Yes (Y) or No(N)**
1	N	26	Y
2	N	27	Y
3	N	28	Y
4	N	29	Y
5	N	30	Y
6	Y	31	N
7	N	32	Y
8	Y	33	Y
9	N	34	Y
10	N	35	Y
11	Y	36	N

12	N	37	Y
13	Y	38	Y
14	N	39	Y
15	Y	40	Y
16	Y	41	Y
17	N	42	Y
18	N	43	Y
19	Y	44	Y
20	N	45	Y
21	Y	46	Y
22	Y	47	Y
23	Y	48	Y
24	Y	49	Y
25	Y	50	Y

A total of 35 cuttings, out of 50 which includes 12 cuttings in group A and 23 cuttings in group B sprouted (Table 1) indicating the presence of relationship between the position of cuttings on the branch and the sprouting of shoots. In order to ascertain this relationship, the data obtained were analysed by $\chi 2$-test using SPSS.

The P-value < 0.001 (appendix) confirms the presence of relationship between position of cuttings on the branch and the sprouting of cuttings. Also Cramer's V=0.480 (appendix) indicates medium effect size.

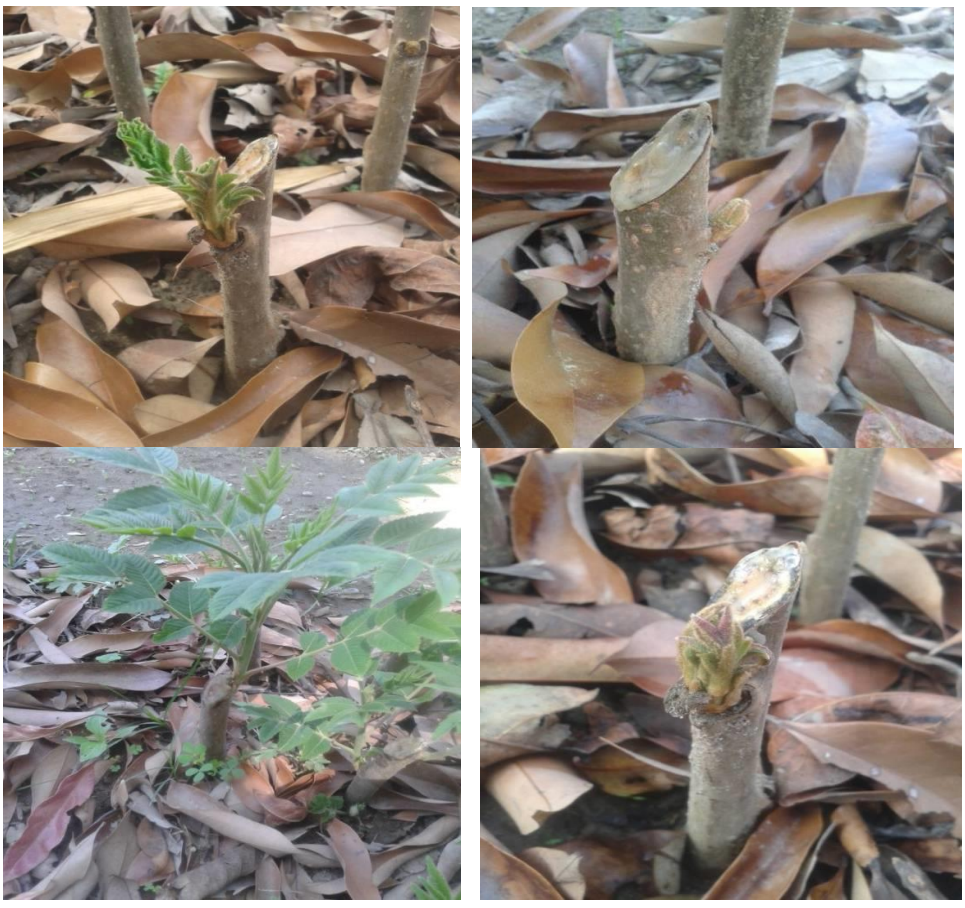


Figure 2: Different Stages of Shoot Development in a Cutting of *R. semialata* Murr.

Rooting

There was no root formation in any of the cuttings, whether sprouted or not and as the result of this, the sprouted shoots

started to dry and die in about one month from the date of sprouting. Within two months from the day of planting, all the cuttings were dry and dead.

CONCLUSIONS

From the experiment, it was observed that most of the cuttings (70 %) sprouted and produced vigorous and healthy shoots. Also, the number of sprouted cuttings which were obtained from the portion of the branch between branch-stem-junction to the centre of the branch was more than those which were obtained from the portion between the centre to the tip of the branch. $\chi 2$- test confirmed the relationship between the sprouting of shoots and the position of cuttings on the branch. But there was no formation of roots in the cuttings. As the result, all the sprouted shoots dried and died in about a month after sprouting. According to Wright (1975), during vegetative propagation, early growth of sprouts depends on food reserve available in the cuttings. Thus, cuttings with sprouted shoots and without roots were alive for some time before they all died out as the food reserve was finished and more food could not be manufactured by the sprouted shoots due to the lack of water for photosynthesis, as there were no roots which are necessary to absorb water from the soil. Duguma (1988) observed that where root formation lags very much behind shoot formation, survival rate becomes very low and the plant is likely to die. Adriance and Brison (1955) reported that low Carbohydrate/Nitrogen ratio encourages better shoot growth but poor root formation. Thai (1977) suggested that early shoot formation might have an unfavourable effect on root formation because this creates a competitive relation between roots and shoot formation for nutrient reserve in the cuttings. In this study also, root formation did not take place despite good shoot development and it resulted in the drying of shoots. Still, further investigation is required for better understanding of the mechanisms behind the failure of the cuttings of *R. semialata* Murr to produce roots so that proper techniques may be developed for the successful vegetative propagation of this important species.

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APPENDIX

Table 1

χ2- Tests					
	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson χ2	11.524[a]	1	.001		
a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 7.50.					

Table 2

Symmetric Measures			
		Value	Approx. Sig.
Nominal by Nominal	Phi	-.480	.001
	Cramer's V	.480	.001
N of Valid Cases		50	